

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	("6627514").PN.	US-PGPUB; USPAT	OR	OFF	2005/12/14 11:00
L2	6	((("20010045614") or ("20020121673") or ("20010023134") or ("4639288") or ("4656730") or ("4839306"))).PN.	US-PGPUB; USPAT	OR	OFF	2005/12/14 11:56
L3	2353	438/221,296,424,426.ccls.	US-PGPUB; USPAT	OR	ON	2005/12/14 11:58
L4	2058	3 and @ad<"20031031"	US-PGPUB; USPAT	OR	ON	2005/12/14 12:01
L5	2014	4 and (trench or opening or hole or groove or recess or aperture)	US-PGPUB; USPAT	OR	ON	2005/12/14 12:00
L6	1479	257/506,510.ccls.	US-PGPUB; USPAT	OR	ON	2005/12/14 11:58
L8	1302	6 and (trench or opening or hole or groove or recess or aperture)	US-PGPUB; USPAT	OR	ON	2005/12/14 12:00
L9	214599	((trench or opening or hole or groove or recess or aperture) and (angle or slop or tapered)).clm.	US-PGPUB; USPAT	OR	ON	2005/12/14 12:02
L10	200984	9 and @ad<"20031031"	US-PGPUB; USPAT	OR	ON	2005/12/14 12:02
L11	5349	((trench or opening or hole or groove or recess or aperture) and (angle or slop or tapered) and transition\$3).clm.	US-PGPUB; USPAT	OR	ON	2005/12/14 12:02
L12	4913	11 and @ad<"20031031"	US-PGPUB; USPAT	OR	ON	2005/12/14 12:03
L13	364	11 and semiconductor	US-PGPUB; USPAT	OR	ON	2005/12/14 12:03

US-PAT-NO: 6548224

DOCUMENT-IDENTIFIER: US 6548224 B1

TITLE: Wiring substrate features having controlled sidewall profiles

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Claims Text - CLTX (1):

1. A method for controlling a sidewall profile of an opening in a layer of photosensitive material, the method comprising: forming a layer of photosensitive material on a substrate; exposing selected portions of the layer of photosensitive material to light from a light source through a photomask, the photomask having selected optical proximity features, to form an exposed portion, an unexposed portion, and a transition portion of the layer, wherein both a size and a spacing of the selected optical proximity features is equal to or smaller than a resolution limit for an exposure tool employed in the exposing of the selected portions; and developing the layer of photosensitive material to form an opening in the layer, the opening having a sloping sidewall.

Claims Text - CLTX (4):

4. The method of claim 1 wherein the opening is a via opening, and further comprising a step of forming a patterned metal layer, a first portion of the patterned metal layer defining a non-circular contact pad on an upper surface of the layer of photosensitive material and a second portion of the patterned metal layer being disposed on the sidewall of the via opening to electrically couple the non-circular contact pad to a conductive feature underlying the via opening.

Claims Text - CLTX (5):

5. The method of claim 1 wherein the layer is a sacrificial layer and wherein the opening defines a trench, and further comprising steps of: forming a patterned metal layer, a portion of the patterned metal layer being disposed in the trench; stripping the sacrificial layer from the substrate to form a metal trace with an overhanging sidewall from the portion of the patterned metal disposed in the trench; dispensing a liquid polymer precursor over the patterned metal layer to fill beneath the overhanging sidewall; and curing the liquid polymer precursor to form a dielectric layer over the patterned metal

layer.

Claims Text - CLTX (6):

6. The method of claim 1 wherein the sidewall of the opening forms an angle of between 50-80 degrees to a plane parallel to the substrate.

Claims Text - CLTX (8):

8. The method of claim 1 wherein the sidewall of the opening forms an angle of between 60-75 degrees to a plane parallel to the substrate.

Claims Text - CLTX (10):

10. The method of claim 1 wherein the opening is an oblong shape with a long-axis intersecting first and second opposing sidewalls and wherein at least said first sidewall forms an angle of between 50-80 degrees to a plane parallel to the substrate.

Claims Text - CLTX (11):

11. The method of claim 10 wherein the second sidewall forms an angle of between 50-80 degrees to a plane parallel to the substrate.

Claims Text - CLTX (12):

12. The method of claim 11 wherein the oblong opening comprises third and fourth opposing sidewalls between said first and second sidewalls and wherein said third and fourth sidewalls are perpendicular to the plane parallel to the substrate.

Claims Text - CLTX (17):

17. A method of forming a contact via in a thin-film stack of a printed wiring substrate, the method comprising: forming a layer of photosensitive dielectric material on a substrate; exposing the layer of photosensitive dielectric material to light from a light source through a photomask, the photomask having a via photo-pattern including optical proximity elements disposed around a first portion of a perimeter of the via photo-pattern and excluding optical proximity elements around a second portion of the perimeter of the via photo-pattern, to form an exposed portion, a non-exposed portion, and a transition portion of the layer of photosensitive dielectric material, wherein both a size and a spacing of the optical proximity elements is equal to or smaller than a resolution limit for an exposure tool employed in the exposing of the layer of photosensitive dielectric material; and developing the layer of photosensitive dielectric material to remove a first portion of the photosensitive dielectric material to thereby form a via opening with a sloped sidewall portion of the via opening corresponding to the first portion

of the perimeter of the via photo-pattern.

Claims Text - CLTX (18):

18. The method of claim 17 further comprising depositing metal over the developed layer of photosensitive dielectric material and in the via opening.

Claims Text - CLTX (19):

19. The method of claim 18 wherein a plurality of via openings are formed in the layer of photosensitive dielectric material such that a pitch between said plurality of via openings is between 50 and 250 microns.

Claims Text - CLTX (20):

20. The method of claim 17 wherein the sidewall of the via opening forms an angle of between 50-80 degrees to a plane parallel to the substrate.

Claims Text - CLTX (21):

21. The method of claim 17 wherein the sidewall of the via opening forms an angle of between 60-75 degrees to a plane parallel to the substrate.

Claims Text - CLTX (22):

22. The method of claim 17 wherein the via opening is an oblong shape with a long-axis intersecting first and second opposing sidewalls and wherein at least said first sidewall forms an angle of between 50-80 degrees to a plane parallel to the substrate.

Claims Text - CLTX (23):

23. The method of claim 22 wherein the second sidewall forms an angle of between 50-80 degrees to a plane parallel to the substrate.

Claims Text - CLTX (24):

24. The method of claim 23 wherein the oblong opening comprises third and fourth opposing sidewalls between said first and second sidewalls and wherein said third and fourth sidewalls are perpendicular to the plane parallel to the substrate.

Claims Text - CLTX (25):

25. A method for controlling a sidewall profile of an opening in a layer of photosensitive material, the method comprising: forming a layer of photosensitive material on a substrate, the layer having an upper surface and a lower surface; exposing selected portions of the layer of photosensitive material to light from a light source through a photomask, the photomask having transparent and opaque portions and having selected optical proximity features,

to form an exposed portion, an unexposed portion, and a transition portion of the layer, wherein both a size and a spacing of the selected optical proximity features is equal to or smaller than a resolution limit for an exposure tool employed in the exposing of the selected portions; and developing the layer of photosensitive material to form an opening through the layer, the opening having a sloping sidewall that results in the opening in the upper surface being larger than an opening in the lower surface.

Claims Text - CLTX (26):

26. The method of claim 25 wherein the opening is a via opening, and further comprising a step of forming a patterned metal layer, a first portion of the patterned metal layer defining a non-circular contact pad on an upper surface of the layer of photosensitive material and a second portion of the patterned metal layer being disposed on the sidewall of the via opening to electrically couple the non-circular contact pad to a conductive feature underlying the via opening.

Claims Text - CLTX (27):

27. The method of claim 25 wherein the layer is a sacrificial layer and wherein the opening defines a trench, and further comprising steps of: forming a patterned metal layer, a portion of the patterned metal layer being disposed in the trench; stripping the sacrificial layer from the substrate to form a metal trace with an overhanging sidewall from the portion of the patterned metal disposed in the trench; dispensing a liquid polymer precursor over the patterned metal layer to fill beneath the overhanging sidewall; and curing the liquid polymer precursor to form a dielectric layer over the patterned metal layer.

Claims Text - CLTX (28):

28. A method of forming a contact via in a thin-film stack of a printed wiring substrate, the method comprising: forming a layer of photosensitive dielectric material on a substrate, the layer having an upper surface and a lower surface; exposing the layer of photosensitive dielectric material to light from a light source through a photomask, the photomask having transparent and opaque portions and having a via photo-pattern including optical proximity elements disposed around a first portion of a perimeter of the via photo-pattern and excluding optical proximity elements around a second portion of the perimeter of the via photo-pattern, to form an exposed portion, a non-exposed portion, and a transition portion of the layer of photosensitive dielectric material, wherein both a size and a spacing of the optical proximity elements is equal to or smaller than a resolution limit for an exposure tool employed in the exposing of the layer of photosensitive dielectric material;

and developing the layer of photosensitive dielectric material to remove a first portion of the photosensitive dielectric material to thereby form a via opening with a sloped sidewall portion that results in the via opening in the upper surface being larger than the via opening in the lower surface.

Claims Text - CLTX (29):

29. The method of claim 28 wherein the sidewall of the via opening forms an angle of between 50-80 degrees to a plane parallel to the substrate.

Claims Text - CLTX (30):

30. The method of claim 28 wherein the sidewall of the via opening forms an angle of between 60-75 degrees to a plane parallel to the substrate.